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EXAMINER	
DANIELS, MATTHEW J	
ART UNIT	PAPER NUMBER
1791	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/761,908	HOLOWCZAK ET AL.	
	Examiner	Art Unit	
	MATTHEW J. DANIELS	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 17-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 17-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. **Claims 1, 2, 4, 5, 7, and 8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Klug (EP 1122227) in view of Whalen (US 5824250) and Auxier (US 6247896). **As to Claim 1**, Klug teaches a method for producing turbine engine blades ([0023]) by investment casting of directionally solidified and/or single crystal superalloy materials ([0011]) comprising:

(a) providing a mold (implicit or obvious in "casting", [0011]) having the shape of the desired ceramic article comprising at least a core ([0023], [0025]) which provides cooling channels within a turbine engine blade ([0023]);

(b) filling the cavity with a ceramic slurry including particles having a size between 0.1 and 50 microns and including a liquid carrier ([0033], [0040]);

(c) cooling to solidify the slurry ([0008]), which would have obviously occurred in a casting mold ([0011]);

(d) removing the article from the mold would have been implicit in that the article is subsequently used in an investment casting process ([0011]);

(e) removing the liquid carrier from the slurry to produce a ceramic article (freeze-dry, [0008]);

(f) Klug suggests casting a metallic article ([0011]) in the shape of a turbine blade ([0023]) having the shape of cooling channels ([0023]).

Klug is silent to (a1) the rapid prototyping process to produce the mold, (a2) the microcircuit dimensions, and (b) the 70% to about 90% by weight of the particles having a size of 0.1 to 50 microns. However, these aspects of the invention would have been prima facie obvious for the following reasons:

(a1) Whalen teaches that it is known to use a rapid prototyping process to produce a disposable mold (3:18-37) for a turbine blade (4:45-67).

(a2) Klug teaches that a range of particle sizes may be used from 120 mesh to 900 mesh ([0033]). It is noted that particles of about 300 mesh to 900 mesh would fall within the claimed range and that particles of about 200 mesh to 900 mesh would fall within the range disclosed by the instant specification. Where the prior art discloses the general conditions of a claim, optimization is normally obvious to the ordinary artisan. In this case, one would have found it obvious to select the appropriate mix of particle sizes from those suggested by Klug and to arrive at the claimed invention through routine optimization.

(b) Auxier teaches that it is known to provide microcircuits in turbine blades (Figs. 1-5) for the purpose of cooling. Whalen provides a rapid prototyping process capable of producing the microcircuit cavities of Auxier.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Whalen and Auxier into that of Klug because (a1) Klug suggests the process to fabricate cores for turbine blades by casting of a slurry, and Whalen teaches a process for casting slurries for making parts related to turbine blades, thus Whalen

teaches a means for carrying out the process suggested by Klug, (b) Klug expressly suggests a shape for providing cooling channels within a turbine blade ([0023]), and Auxier teaches the configuration and size of desired (microcircuit) channels in a turbine blade, thus Klug suggests the method or sizes disclosed by Auxer.

As to Claim 2, the Klug process may be aqueous based ([0033] and elsewhere). **As to Claim 4**, Whalen teaches wax (3:24-27), among other materials, and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claim 5**, Whalen teaches that the mold may be removed prior to the removal of the original liquid carrier (3:54-58), and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claim 7**, Klug uses freeze-drying under vacuum ([0008]). As to Claim 8, Klug teaches that sintering may be performed ([0029]).

2. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Klug (EP 1122227) in view of Whalen (US 5824250) and Auxier (US 6247896), and further in view of Smith-Johannsen (USPN 4246209). Klug, Whalen, and Auxier teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 3**, Klug is silent to the cryoprotectant and the exact mixture claimed. However, Smith-Johannsen teaches (a) a mixture of ceramic particles (3:48), (b) an amount of cryoprotectant which suppresses ice crystal formation (4:1-26), (c) about 15% colloidal ceramic material (silica sol is colloidal ceramic, 6:57-58 and 2:44), (d) optional other additives (3:13-33), and water (6:16-18). Although silent to the particular amounts and sizes of the ceramic particles, it is submitted that Smith-Johannsen clearly suggests an optimized quantity (6:11-16) of small particles below 200 mesh (1:65-68), as does Klug (see the rejection of Claim

1). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Smith-Johannsen into the modified method of Klug because Klug suggests that freezing is performed ([0008]), a mixture of ceramic particles is used ([0040]), and that water ([0028]) and silica may be used ([0024], [0025]), and because Smith-Johannsen provides a cryoprotectant that would improve freezing behavior, a mixture of particles, a similar material, and other additives which would improve the process. Thus, Smith-Johannsen provides materials suggested by Klug, or Smith-Johannsen teaches a similar freeze-drying process with certain improvements that would also be recognized by those in the art as desirable for use with the Klug process to provide the same benefits.

3. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Klug (EP 1122227) in view of Whalen (US 5824250) and Auxier (US 6247896), and further in view of Weaver (USPN 4341725). Klug, Whalen, and Auxier teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 6**, it is unclear whether Klug removes the mold before or after drying, however, it is submitted that performing these steps in a rearranged order would have also been prima facie obvious. Additionally, Weaver teaches that it is known to dry prior removal of the mold (2:2-4). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Weaver into the modified method of Klug because one would have recognized from the Weaver process that any order of performing these steps could have been used.

4. **Claims 17, 18, 20, 21, 23-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Klug (EP 1122227) in view of Whalen (US 5824250), Auxier (US 6247896), and Campion (USPN 5503218).

As to Claim 17, Klug teaches a method for producing turbine engine blades ([0023]) by investment casting of directionally solidified and/or single crystal superalloy materials ([0011]) comprising:

(a) providing a mold (implicit or obvious in "casting", [0011]) having the shape of the desired ceramic article comprising at least a core ([0023], [0025]) which provides cooling channels within a turbine engine blade ([0023]), and a shell ([0031]) which would have the desired external configuration;

(c) filling the cavity with a ceramic slurry including particles having a size between 0.1 and 50 microns and including a liquid carrier ([0033], [0040]);

(d) cooling to solidify the slurry ([0008]), which would have obviously occurred in a casting mold ([0011]);

(e) removing the article from the mold would have been implicit in that the article is subsequently used in an investment casting process ([0011]);

(f) removing the liquid carrier from the slurry to produce a ceramic article (freeze-dry, [0008]) to produce an article which forms a core ([0023], [0025]) and shell ([0031]);

(f) Klug suggests casting a metallic article ([0011]) in the shape of a turbine blade ([0023]) having the shape of cooling channels ([0023]).

Klug is silent to (a1) the rapid prototyping process to produce the mold, (a2) the microcircuit dimensions, (b) placing the disposable model in a container, and (c) the 70% to

about 90% by weight of the particles having a size of 0.1 to 50 microns. However, these aspects of the invention would have been prima facie obvious for the following reasons:

(a1) Whalen teaches that it is known to use a rapid prototyping process to produce a disposable mold (3:18-37) for a turbine blade (4:45-67).

(a2) Klug teaches that a range of particle sizes may be used from 120 mesh to 900 mesh ([0033]). It is noted that particles of about 300 mesh to 900 mesh would fall within the claimed range and that particles of about 200 mesh to 900 mesh would fall within the range disclosed by the instant specification. Where the prior art discloses the general conditions of a claim, optimization is normally obvious to the ordinary artisan. In this case, one would have found it obvious to select the appropriate mix of particle sizes from those suggested by Klug and to arrive at the claimed invention through routine optimization.

(b) Campion teaches an external shape corresponding to the desired external configuration and an internal passage shape (2:53-56 and area between 2 and 4 in Fig. 2) corresponding to the shape of the desired metallic part internal passage shape of the metallic part (area between 2 and 4 in Fig. 2) and placing the temporary pattern in a container (Fig. 4). Auxier teaches that this internal passage may have a microcircuit shape and dimension in order to provide cooling.

(c) Auxier teaches that it is known to provide microcircuits in turbine blades (Figs. 1-5) for the purpose of cooling. Whalen provides a rapid prototyping process capable of producing the microcircuit cavities of Auxier.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Whalen and Auxier into that of Klug because (a1) Klug suggests the process to fabricate cores for turbine blades by casting of a slurry, and Whalen

teaches a process for casting slurries for making parts related to turbine blades, thus Whalen teaches a means for carrying out the process suggested by Klug, (b) Klug expressly suggests a shape for providing cooling channels within a turbine blade ([0023]), and Auxier teaches the configuration and size of desired (microcircuit) channels in a turbine blade, thus Klug suggests the method or sizes disclosed by Auxer.

As to Claim 18, the Klug process may be aqueous based ([0033] and elsewhere). **As to Claim 20**, Whalen teaches wax (3:24-27), among other materials, and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claim 21**, Whalen teaches that the mold may be removed prior to the removal of the original liquid carrier (3:54-58), and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claims 23 and 24**, Klug teaches freeze-drying (drying while frozen) ([0008]) and sintering ([0029]). **As to Claim 25**, Campion teaches a plurality of channels which extend through the model and connect the external surface of the model with the internal surface of the model (Fig. 2), which are interpreted to have microcircuit dimensions. **As to Claim 26**, Auxier teaches that it is known to provide channels with microcircuit dimensions having a complex geometry (Fig. 5), which would be provided in the method of Klug in order to increase the cooling of the article.

5. **Claim 19** is rejected under 35 U.S.C. 103(a) as being unpatentable over Klug (EP 1122227) in view of Whalen (US 5824250) and Auxier (US 6247896), Campion (USPN 5503218), and further in view of Smith-Johannsen (USPN 4246209). Klug, Whalen, Auxier, and Campion teach the subject matter of Claim 17 above under 35 USC 103(a). **As to Claim 19**, Klug is silent to the cryoprotectant and the exact mixture claimed. However, Smith-Johannsen

teaches (a) a mixture of ceramic particles (3:48), (b) an amount of cryoprotectant which suppresses ice crystal formation (4:1-26), (c) about 15% colloidal ceramic material (silica sol is colloidal ceramic, 6:57-58 and 2:44), (d) optional other additives (3:13-33), and water (6:16-18). Although silent to the particular amounts and sizes of the ceramic particles, it is submitted that Smith-Johannsen clearly suggests an optimized quantity (6:11-16) of small particles below 200 mesh (1:65-68), as does Klug (see the rejection of Claim 1). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Smith-Johannsen into the modified method of Klug because Klug suggests that freezing is performed ([0008]), a mixture of ceramic particles is used ([0040]), and that water ([0028]) and silica may be used ([0024], [0025]), and because Smith-Johannsen provides a cryoprotectant that would improve freezing behavior, a mixture of particles, a similar material, and other additives which would improve the process. Thus, Smith-Johannsen provides materials suggested by Klug, or Smith-Johannsen teaches a similar freeze-drying process with certain improvements that would also be recognized by those in the art as desirable for use with the Klug process to provide the same benefits.

6. **Claim 22** is rejected under 35 U.S.C. 103(a) as being unpatentable over Klug (EP 1122227) in view of Whalen (US 5824250) and Auxier (US 6247896), Campion (USPN 5503218), and further in view of Weaver (USPN 4341725). Klug, Whalen, Auxier, and Campion teach the subject matter of Claim 17 above under 35 USC 103(a). **As to Claim 22**, it is unclear whether Klug removes the mold before or after drying, however, it is submitted that performing these steps in a rearranged order would have also been prima facie obvious.

Additionally, Weaver teaches that it is known to dry prior removal of the mold (2:2-4). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Weaver into the modified method of Klug because one would have recognized from the Weaver process that any order of performing these steps could have been used.

Response to Arguments

7. Applicant's arguments filed 5 May 2008 have been fully considered but they are not persuasive or are moot in view the new grounds of rejection above. The arguments appear to be on the following grounds:

(a) Neither Smith-Johannsen nor Whalen teaches making metal parts. Their end products are ceramic objects. To the inventors' best knowledge, the claimed method to produce cast metallic gas turbine components having internal passages with microcircuit dimensions using ceramic molds produced by (a) rapid prototyping and (b) freeze casting ceramic slurry technologies has not been accomplished heretofore in the art and is considered to be a novel and nonobvious breakthrough in producing cast metallic turbine blades.

8. These arguments are not persuasive for the following reasons:

(a) A new rejection is set forth above to address the amended claim. Klug is instructive of the state of the art at the time of the invention. Klug teaches forming shell molds or cores for forming cooling channels in cast metallic turbine blade components. Thus (b) freeze casting ceramic slurry to produce a core or mold is submitted to be known and obvious. While Klug

fails to expressly teach many details about the mold or how the mold was made, it is submitted that in the absence of such details, one would be led to conventional methods for fabricating molds. Whalen demonstrates that (a) rapid prototyping of molds for casting ceramic slurries is also known.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. DANIELS whose telephone number is (571)272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew J. Daniels/
Primary Examiner, Art Unit 1791
8/13/08